We claim:

1. A method for evaluating characteristics of the ion implantation in a shallow junction formed on a semiconductor sample comprising the steps of:

measuring the sample response to a periodic excitation using an optical probe and generating first output signals;

measuring the response of the sample to reflected light from a broad band wavelength source by analyzing the change in either magnitude or phase of the light induced by reflection off the surface of the sample and generating a plurality of second output signals corresponding to different wavelengths; and

determining the energy and dose of the implant used to create the shallow junction using an algorithm which simultaneously regresses data corresponding to a combination of both the first and second output signals.

2. A method as recited in claim 7, wherein the first output signals are used primarily to determine the extent of the damage caused by the ion implantation while the second output signals are used primarily to determine the depth of the damage caused by the ion implantation.

3. A method as recited in claim 7, wherein the second output signals corresponding to a plurality of wavelengths are generated simultaneously.

4. A method as recited in claim 7, wherein the sample is measured with another optical probe and third output signals are generated in response thereto and the concentration of the ion implantation and the energy of the implant is evaluated based on a combination of the first, second and third output signals.

5. A method of forming a shallow junction in a semiconductor wafer comprising the steps of:

implanting ions into the semiconductor wafer;

periodically exciting a portion of the wafer coincident with the implanted region;

monitoring the modulated response of the wafer to the periodic excitation with an optical probe and generating first output signals;

directing a polychromatic light beam within the same region on the surface of the wafer so that it reflects off the sample;

monitoring either the phase or magnitude changes of the polychromatic light beam after interacting with the wafer and generating a plurality of second output signals corresponding to a plurality of different wavelengths; and

determining whether both the concentration of the ion implantation and the energy of the implant are within a predetermine range, wherein said determination is based on evaluating a combination of both the first and second output signals.

6. A method as recited in claim 5, wherein modulated optical reflectivity of the sample induced by the periodic excitation is monitored.

7. A method as recited in claim 5, wherein the change in polarization state of the polychromatic light beam is measured at a plurality of wavelengths.

8. A method as recited in claim 5, wherein the first output signals are used primarily to determine the extent of the damage caused by the ion implantation while the second output signals are used primarily to determine the depth of the damage caused by the ion implantation.

9. A method as recited in claim 5, wherein the second output signals corresponding to a plurality of wavelengths are generated simultaneously.

10. A method as recited in claim 5, wherein the sample is measured with another optical probe and third output signals are generated in response thereto and the concentration of the ion implantation and the energy of the implant is evaluated based on a combination of the first, second and third output signals.

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